

A Summary of Research Report  
Grant No. NGT-1-52101

***Integrated Task and Data Parallel Programming***

Submitted to:

National Aeronautics and Space Administration  
Langley Research Center  
Hampton, VA 23681-0001

Attention:

Ms. Barbara Thomson, LaRC Grant Officer  
M/S 128

Submitted by:

A. S. Grimshaw  
Associate Professor

Emily A. West  
Graduate Student

Department of Computer Science  
SCHOOL OF ENGINEERING AND APPLIED SCIENCE  
UNIVERSITY OF VIRGINIA  
CHARLOTTESVILLE, VIRGINIA

Report No. UVA/528538/CS99/101  
November 1998

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National Aeronautics and  
Space Administration  
Langley Research Center  
Hampton, VA 23681-0001



Reply to Attn of: 128/MGC

October 19, 1998

Attn: Mr. D. Wayne Jennings  
Director of Sponsored Programs  
Post Office Box 8003  
Charlottesville, VA 22903

Subject: NASA Langley Research Center (LaRC) Training Grant NGT-1-52101 - Notice  
of Delinquent *Summary of Research* Report Submission  
(Student: Emily A. West, Mentor: Dr. Andrew S. Grimshaw)

The purpose of this letter is to inform you that your institution is beyond the 90-day grace period allowed for the submission of the *Summary of Research* report required by the subject training grant. The grant expired on 8/30/98 (Supplement No. 2).

Pursuant to the NASA Grant and Cooperative Agreement Handbook, Section 1260.21, a *Summary of Research* report is due within 90 days after the expiration of the training grant, regardless of whether or not support is continued under another training grant. There is no specified format for this report; however, it should include, as a minimum, a comprehensive summary of significant accomplishments made throughout the total period of the grant.

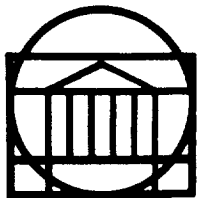
Inasmuch as the *Summary of Research* report is the only deliverable required under the subject training grant, it is imperative that the LaRC Grant Officer, Mail Stop 128, receive this report. Copies of the report should also be submitted to 139/Dr. David H. Rudy, LaRC Technical Officer, and to the NASA Center for Aerospace Information (CASI). The CASI copy should be micro-reproducible and should be submitted to CASI's NEW address below:

Attn: Accessioning Department, Parkway Center  
NASA Center for Aerospace Information (CASI)  
7121 Standard Drive  
Hanover, MD 21076-1320

If the *Summary of Research* report has not been submitted to the undersigned by November 20, 1998, the Center will withhold all future grants, grant supplements, and/or payments to your institution. You should contact the LaRC Grant Administrator, Ms. Barbara Thomson at (757) 864-6042 or her email at [b.s.thomson@larc.nasa.gov](mailto:b.s.thomson@larc.nasa.gov) to make arrangements for submitting this delinquent report. If you have other questions regarding this requirement, contact me at (757) 864-2477 or email me at [r.t.lacks@larc.nasa.gov](mailto:r.t.lacks@larc.nasa.gov).

A handwritten signature in black ink, appearing to read "R. Todd Lacks".

R. Todd Lacks  
LaRC Grant Officer



## DEPARTMENT OF COMPUTER SCIENCE

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FAX (804) 982-2214  
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To: Sherry Fitzgerald

From: Andrew Grimshaw

Reference: NASA 5-28538, Emily West

Emily West was a student of mine for approximately eighteen (18) months of this fellowship. In February 1997, Ms. West dropped out of the Ph.D. program. Emily finished her Masters but did not complete the Ph.D. - she is ABD. Emily subsequently moved to Chapel Hill, NC (her husband took a job there) and entered the CS program at UNC.



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EMILY ARCHER WEST

RECORD ID 231041839  
BIRTHDATE  
DATE PRINTED 04/09/97

COURSE NUMBER	COURSE TITLE	GRADE	CREDITS	COURSE NUMBER	COURSE TITLE	GRADE	CREDITS
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# DEGREES CONFERRED

MS/COMPUTER SCIENCE

MAY 22, 1994

THESIS: COMBINING CONTROL AND DATA  
PARALLELISM: DATA PARALLEL  
EXTENSIONS TO THE MENTAT PROGRAMMING  
LANGUAGE

## MAJOR

COMPUTER SCIENCE

## COMPLETED COURSES

### FALL 1991 GRAD ENGINEERING AND APPLIED SCIENCE

C S 461	ANAL ALGORITHMS	AU	3.0
C S 454	COMPUTER ORG	B+	3.0
C S 682	DIGITAL PICT PROC	A	3.0
C S 696	GRADUATE SEMINAR	S	1.0
C S 898	MASTERS RESEARCH	S	3.0

### SPRING 1992 GRAD ENGINEERING AND APPLIED SCIENCE

C S 696	OPERATING SYSTEMS	A	3.0
C S 660	COMPUTATION THRY	B+	3.0
C S 451	COMPRIDE PAR PROC SYS	A	3.0
C S 898	MASTERS THESIS RES	S	3.0

### SUMMER 1992 GRAD ENGINEERING AND APPLIED SCIENCE

C S 498	MASTERS THESIS RES	S	6.0
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### FALL 1992 GRAD ENGINEERING AND APPLIED SCIENCE

C S 651	AN INTRO TO PARALLEL COM	A	3.0
C S 850	PROGRAMMING LANGUAGE	A	3.0
C S 898	MASTERS RESEARCH	S	6.0

### SPRING 1993 GRAD ENGINEERING AND APPLIED SCIENCE

APMA 642	STATISTICS FOR ENGR & SCI	A	3.0
C S 898	MASTERS THESIS RESEARCH	S	9.0

### SUMMER 1993 GRAD ENGINEERING AND APPLIED SCIENCE

C S 898	MASTERS THESIS RESEARCH	S	6.0
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### FALL 1993 GRAD ENGINEERING AND APPLIED SCIENCE

C S 601	ANALYSIS OF ALGORITHMS	B+	3.0
C S 851	BATA ADV PARALLEL COMPUTING	A	3.0
C S 898	MASTERS RESEARCH	S	6.0

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C S 850	ADVANCED OPERATING SYSTEMS	A	3.0
C S 898	DISSERTATION RESEARCH	S	9.0

PAGE 1 OF 2 / CONTINUED ON NEXT PAGE \*\*\*

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*Ann R. Antrobus*  
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**DEGREES CONFERRED**

MS/COMPUTER SCIENCE

MAY 22, 1994

THESIS: COMBINING CONTROL AND DATA  
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EXTENSIONS TO THE MENTAT PROGRAMMING  
LANGUAGE

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**COMPLETED COURSES**

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C S 757	COMPUTER NETWORKS	B	3.0
C S 999	PH.D. DISSERTATION	S	9.0

**SPRING 1995 GRAD ENGINEERING AND APPLIED SCIENCE**

C S 771	TRANSLATION WRITING SYS	A	3.0
C S 999	DISSERTATION RESEARCH	S	9.0

**SUMMER 1995 GRAD ENGINEERING AND APPLIED SCIENCE**

C S 999	DISSERTATION RESEARCH	S	6.0
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C S 891	SPTP ADVANCED TRANSLATORS	A	3.0
C S 999	PH.D. DISSERTATION	S	6.0

**SPRING 1996 GRAD ENGINEERING AND APPLIED SCIENCE**

C S 999	DISSERTATION RESEARCH	S	9.0
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**SUMMER 1996 GRAD ENGINEERING AND APPLIED SCIENCE**

C S 999	DISSERTATION RESEARCH	S	6.0
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**CURRENT AND PLANNED COURSES**

**SPRING 1997 GRAD ENGINEERING AND APPLIED SCIENCE**

C S 999	DISSERTATION RESEARCH		12.0
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Ann R. Antrobus  
UNIVERSITY REGISTRAR



# Integrated Task and Data Parallel Programming Language Design

## NASA Graduate Student Researchers Program Langley Research Center

Emily A. West, University of Virginia

Andrew S. Grimshaw, Faculty Advisor, University of Virginia

Manuel D. Salas, Technical Advisor, Langley Research Center

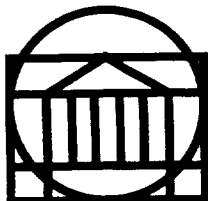
**Proposed Research** This research investigates the combination of task and data parallel language constructs within a single programming language. There are an number of applications that exhibit properties which would be well served by such an integrated language. Examples include global climate models, aircraft design problems, and multidisciplinary design optimization problems.

Our approach incorporates data parallel language constructs into an existing, object oriented, task parallel language. The language will support creation and manipulation of parallel classes and objects of both types (task parallel and data parallel). Ultimately, the language will allow data parallel and task parallel classes to be used either as building blocks or managers of parallel objects of either type, thus allowing the development of single and multi-paradigm parallel applications.

**1995 Research Accomplishments** In February I presented a paper at Frontiers '95 describing the design of the data parallel language subset. During the spring I wrote and defended my dissertation proposal. Since that time I have developed a runtime model for the language subset. I have begun implementing the model and hand-coding simple examples which demonstrate the language subset. I have identified an astrophysical fluid flow application which will validate the data parallel language subset.

**1996 Research Agenda** Milestones for the coming year include implementing a significant portion of the data parallel language subset over the Legion system. Using simple hand-coded methods, I plan to demonstrate (1) concurrent task and data parallel objects and (2) task parallel objects managing both task and data parallel objects. My next steps will focus on constructing a compiler and implementing the fluid flow application with the language. Concurrently, I will conduct a search for a real-world application exhibiting both task and data parallelism within the same program.

**Additional 1995 Activities** During the fall I collaborated with Andrew Grimshaw and Adam Ferrari to write a book chapter which will be included in *Parallel Processing in C++* edited by Gregory Wilson. I also finished two courses, Compilers and Advanced Compilers, in 1995. These courses complete my class requirements at the University of Virginia. I have only my dissertation research and defense to complete.



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Emily A. West  
west@Virginia.EDU  
(804) 982-2294  
(804) 982-2200

June 6, 1997

Mr. Roger Hathaway  
NASA Langley Research Center  
Office of Education  
Mail Stop 400  
Hampton, VA 23681

Dear Mr. Hathaway


[REDACTED]

During the Fall semester of 1996 I took a leave of absence from the University of Virginia in order to resolve a personal problem. To the best of my knowledge, my previous advisor, Dr. Andrew Grimshaw did not contact NASA and inform you of this development because he wanted to wait until the situation was resolved. I realize now that it was also partly my responsibility to notify NASA, however at the time I was unaware of the proper policies. I do apologize for not contacting you when the difficulties began. I was re-enrolled at UVA for the Spring semester 1997, which has just been completed, and I intend to register for the Summer session on June 9th during the registration period.

I have since resolved the problems, in part, by finding a new advisor (Jim French) at UVA and beginning to search for a new dissertation topic that would be acceptable under the GSRP guidelines for my fellowship. At this time Dr. French and I submitted the request for a no-cost extension to the GSRP grant.

Since that time, my husband has accepted a faculty position at the University of North Carolina. In conjunction with this, the Computer Science department at UNC has accepted my application for transfer beginning in the Fall semester of 1997. In many ways, this is an ideal solution to the entire situation. There are two faculty members at UNC who could be my advisor. Each of their research areas is closely related to my previous course of study and dissertation topic while I worked with Dr. Grimshaw. (If I were to remain at UVA and work with Dr. French I would change my focus to a different area of parallel computing.) Therefore, transferring to UNC affords me the opportunity to continue in the area of my original GSRP proposal and to complete my Ph.D. degree.

In light of this situation, I would very much like to retain my current GSRP fellowship through this summer and next year since the support I have received thus far has helped me greatly. If the no-cost extension for this fellowship is granted, I would then like to submit an additional request to have the balance of the fellowship transferred to UNC. If I do submit this additional request, then I would like to seek your advice on the proper procedures. This summer I intend to prepare for the upcoming semester at UNC by continuing my readings in my research area, reviewing the research programs of both potential advisors at UNC and by reviewing the prerequisite materials for the course I will be taking in the Fall. UNC has required that I take at least two additional courses.



Sincerely,

Emily A. West

CC: Dr. James C. French, Dept. of Computer Science, UVA  
Dr. Andrew Grimshaw, Dept. of Computer Science, UVA  
F. Cline, Research Administration, UVA



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